# COLEOPTERA ASSOCIATED WITH AN *HYPOXYLON* SPECIES (ASCOMYCETES: XYLARIACEAE) ON OAK

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Abstract

Fifteen beetle species representing 10 families were found under bark of a live oak (*Quercus virginiana*) blown down one year previously. Nearly all were evidently feeding on conidia or stromatic tissue of the ascomycete fungus *Hypoxylon,* a habitat which is briefly discussed. Published European records of beetles from similar hosts in *Hypoxylon* and *Daldinia* are summarized, along with some additional records of beetles from these hosts in North America. Additional study of these fungi may shed light on the feeding habits of many of the smaller cucujoid Coleoptera.

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On September 17, 1976 on Skidaway Island, near Savannah, Georgia, a number of adult and larval beetles were collected on the surface and just under the outer bark of a live oak (*Quercus virginiana* Mill.) which had been blown down by wind the year before. The beetles were associated with the flat stromata (fruiting structures) of an ascomycete fungus, some of which were covered with conidia (asexual spores), and were located either on these stromata or under raised portions of bark surrounding them. E. S. Lutrell of the University of Georgia and J. D. Rogers of Washington State University identified the fungus as a species of *Hypoxylon* in the Section Applanata and probably *Hypoxylon atropunctatum* (Schweinitz ex Fries) Cooke. Samples were taken back to Cambridge, and additional specimens were reared out in the laboratory. Fifteen species of Coleoptera were found in association with this fungus, and 8 of these were present as immatures. In addition, 1 species of Lepidoptera, 2 Hymenoptera, and 6 or 7 Diptera were collected in small numbers, but these are not treated further in the present account.

The life cycles of many Ascomycetes are complex, and the terminology employed may be found in a general text, such as Scagel *et al.* (1965). According to Rogers (personal communication), this particular fungus has a bipartite stroma, the outer part of which is thrown off with the bark, leaving the exposed, brownish, stromatic tissue. The latter produces masses of conidia, which give the surface a dull greenish-gray appearance. The bark surrounding the exposed stroma was often slightly raised, and pockets of moisture were present beneath the bark. Most of the beetles were hidden beneath the bark, but tracks could be seen where they crossed the conidial patches in feeding. The outer section of the stroma consists of 2 layers of brownish, pseudoparenchymatous cells in between which is a layer of whitish tissue.

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Beneath the outer section is a thicker layer of blackish stromatic tissue in which are embedded the immature perithecia. The surface conidia appeared to be the *Nodulisporium* type according to Lutrell (personal communication).

As will be seen below, many of the beetles were feeding on the abundant conidia, but some were taking in stromatic tissue or even hyphae. In addition to the *Hypoxylon,* a lichen was present on the bark surface, and fruiting bodies of *Stereum ostrea* (Blume and Nees) Fries occurred on various parts of the tree. The following is an annotated list of the Coleoptera collected:

TROGOSITIDAE.

*Tenebroides* sp. 3 larvae (keyed out in Crowson 1964). Gut sample contained no recognizable material; granular matter only. At least some species in the genus are known predators.

NITIDULIDAE.

*Prometopia sexmaculata* (Say). 8 larvae (illustrated in Böving and Craighead 1931). Gut sample contained large numbers of conidia, several pieces of stromatic tissue, and a few hyphae.

RHIZOPHAGIDAE: MONOTOMINAE.

*Bactridium ephippigerum* (Guérin-Méneville). 42 adults, 50 larvae (reared). Gut samples contained much stromatic tissue with a few hyphae and conidia.

CUCUJIDAE: LAEMOPHLOEINAE.

*Laemophloeus biguttatus* (Say). 36 adults, 30 larvae (reared). Gut samples consisted almost exclusively of conidia.

CORYLOPHIDAE.

*Molamba lepida* (LeConte). 1 adult.

LATHRIDIIDAE.

*Enicmus maculatus* LeConte. 9 adults, 7 larvae (reared). Gut sample contained only conidia.

BIPHYLLIDAE.

*Diplocoelus rudis* LeConte. 1 adult under bark, but not in immediate vicinity of stromata.

MYCETOPHAGIDAE.

*Litargus sexpunctatus* (Say). 16 adults, 30 larvae (reared). Gut samples consisted almost exclusively of conidia. The elytral pattern of most individuals is not typical for the species, in that there are 2 additional spots on each elytron.

*Litargus balteatus* LeConte. 3 adults.

COLYDIIDAE.

*Aulonium parallelopipedum* (Say). 1 adult, 1 larva? This larva is superficially similar to that of *Aulonium tuberculatum* LeConte and *A. longum* LeConte, but it is somewhat more flattened with much finer tergal carinae. It could also be the larva of *Eulachus carinatus* LeConte, since the affinities of that species are in doubt.

*Eulachus carinatus* LeConte. 2 adults.

*Synchita fuliginosa* Melsheimer. 1 adult.

*Bitoma quadriguttata* Say. 1 adult.

*Bitoma quadricollis* Horn. 20 adults, 11 larvae (reared). Gut samples included mainly stromatic tissue, with some hyphae and very few conidia.

SCOLYTIDAE.

*Hypothenemus eruditus* Westwood. 1 adult.

The flattened and thus less conspicuous stromata of certain *Hypoxylon* and other Ascomycetes may well be a common habitat for a number of species of rhizophagids, cucujids, lathridiids, mycetophagids, and colydiids, which are usually recorded as occurring under chips of outer bark or on bark surfaces. In this particular sample, *Prometopia, Laemophloeus, Enicmus,* and *Litargus* appeared to be specializing on conidia, while *Bactridium* and *Bitoma* were feeding primarily on stromatic tissue. It is possible, however, that this reflects the distribution of conidia-producing surfaces in any one area of the bark. The conidial surface is an ephemeral habitat, since

it is soon eaten or worn off any particular patch of stroma. The same beetles may be able to subsist on the worn stromatic surface, and these or perhaps a new set may utilize the mature perithecia. The Lathridiidae are known to be spore specialists, but the feeding habits of the other families are variable or not very well documented. The single specimens of *Molamba* and *Diplocoelus* may be significant, since the Corylophidae are spore feeders and the Biphyllidae have been associated with other xylariaceous fungi; the occurrence of the bark beetle *Hypothenemus,* on the other hand, is fortuitous.

In the European literature, several beetle species have been recorded from *Hypoxylon* species and from the related xylariaceous fungus *Daldinia concentrica*. These records may be summarized as follows:

CRYPTOPHAGIDAE.

*Cryptophagus dentatus* Herbst and *Cryptophagus ruficornis* Stephens on *Daldinia concentrica* (Bolton ex Fries) Cesati and Notaris (Donisthorpe 1935; Hingley 1971).

BIPHYLLIDAE.

*Diplocoelus fagi* Guérin-Méneville on *Hypoxylon fuscum* Persoon ex Fries (Donisthorpe 1935).

*Biphyllus lunatus* (Fabricius) on *Daldinia concentrica* (Crowson and Hunter 1964; Donisthorpe 1935; Hingley 1971).

MYCETOPHAGIDAE.

*Mycetophagus atomarius* Fabricius on *Daldinia concentrica* (Hingley 1971) and on *Hypoxylon deustum* (Hoffman ex Fries) Greville (Crowson 1960).

*Litargus connexus* (Geoffroy) on *Daldinia concentrica* (Hingley 1971).

COLYDIIDAE.

*Cicones variegatus* (Hellwig) on *Hypoxylon duestum* (Donisthorpe 1935).

ANTHRIBIDAE.

*Platyrrhinus resinosus* (Scopoli) on *Daldinia concentrica* (Crowson and Hunter 1964; Donisthorpe 1935).

In Hingley's study of known age *Daldinia* stromata, *Biphyllus lunatus, Cryptophagus ruficornis,* and *Mycetophagus atomarius* were present during periods of active spore dispersal, while *Litargus connexus* and *Cryptophagus dentatus* were present in older stromata.

In North America, adults (one of which was teneral) of *Litochropus scalptus* Casey (Phalacridae) were collected in the stroma of *Daldinia concentrica* in Vermont, while an unidentified phalacrid larva was taken in the same fungus in Massachusetts. Adults and larvae of *Litochropus clavicornis* Casey were found on the stromata of *Daldinia simulans* in Texas. This same fungus produced adults and larvae of *Placonotus illustris* Casey(?) (Cucujidae: Laemophloeinae), *Litargus balteatus* LeConte, and a species of *Tenebroides.* A closer examination of *Daldinia, Hypoxylon,* and other ascomycete fungi may well shed light on the feeding habits of many of the smaller cucujoid Coleoptera.

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## LITERATURE REVIEW

**Labelling and storing an insect collection** (4-H members' guide M-6-7), by Robert Dirig. 1977. New York State College of Agriculture and Life Sciences, Mailing Room, Building 7, Research Park, Cornell University, Ithaca, NY 14853. Paper cover, 21p., $1.25.

Robert Dirig has prepared a truly outstanding instructional pamphlet, on labelling and storing insects, for 4-H members and leaders. The scientific value of insect collections is discussed and very detailed instructions for meaningful labelling are presented. The importance and sources of maps, pens, and even a miniature printing press are described and illustrated. Instructions for proper pinning and storing of specimens are included. The author lists several regions in New York State where little collecting has been done in the past. It is interesting to note that well known resort areas such as the Catskills and the Adirondacks are in need of serious collecting. This guide may have been written for 4-H members, but it undoubtedly will be used by many entomologists (including amateurs and professionals). It is an excellent buy at the price listed!

—P.P.S.